

## **Tardigrada nova: a bibliographic analysis and catalogue of new species described in *Zootaxa* before 2006**

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### **Abstract**

During 2002 to 2005, 35 papers on Tardigrada were published in *Zootaxa* by 22 authors from nine countries with descriptions of 33 new species. A bibliographic analysis of these papers is presented here along with a catalogue of new species of Tardigrada described in these papers.

**Key words:** Tardigrada, biodiversity discovery, species description, historical pattern, zoological nomenclature, dating

### **Introduction**

Since its inception in 2001, *Zootaxa* has established itself as an important journal for publishing new taxa of the world's undescribed animals. Article 8 (Recommendation 8A) of the *International Code of Zoological Nomenclature* (The International Commission on Zoological Nomenclature 1999) urges authors and editors to ensure that new scientific names and other nomenclatural acts are made widely known. *Zootaxa* has followed this recommendation by ensuring its papers are indexed in *Zoological Record* and also by providing abstracts of all papers free online. This contribution is the first of a series to provide full catalogues of zootaxa nova described in this journal. All contributions in this series will be provided free online for open access to ensure wide dissemination.

### **Tardigrade papers in *Zootaxa*: a bibliographic analysis**

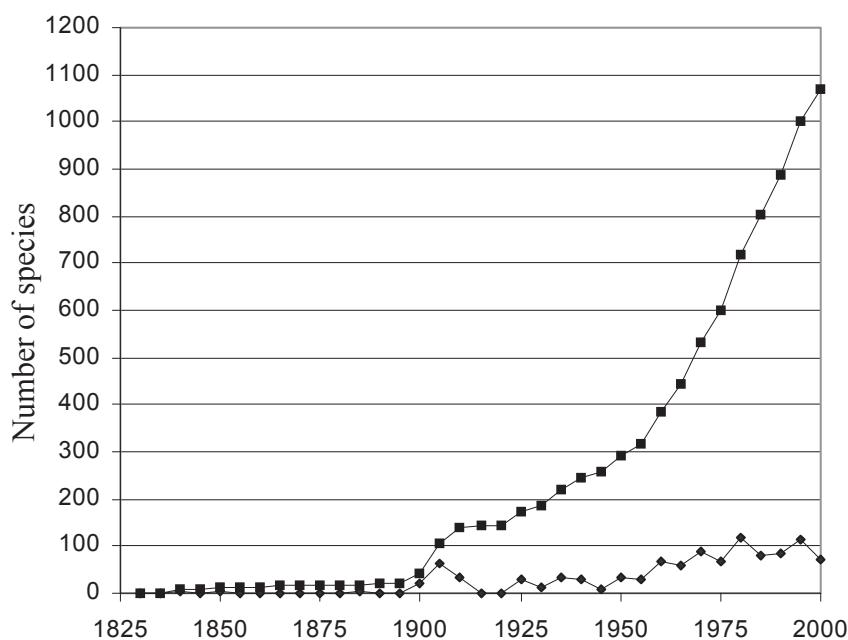
During 2002–2005, 35 papers on Tardigrada were published in *Zootaxa*: 1 in 2002, 10 in 2003, 6 in 2004 and 18 in 2005. The length of paper ranges from 4 to 46, with an average of 9.74, which is much shorter than the average length (22) of papers in *Zootaxa*. These papers were contributed by 22 authors from ten countries: Italy (5), China (5), Poland (3),

Australia (2), UK (2), USA (2), Russia (1), Slovakia (1) and Spain (1). Pilato of Italy is the most productive author, having published 11 papers. He is followed by Kaczmarek and Michalczyk of Poland (each 10 papers), Binda of Italy, Li of China and Lisi of Italy (each 6 papers), Bertolani of Italy, Tumanov of Russia and Wang of China (each 4 papers), Beasley of USA, Guidetti of Italy, McInnes of UK, Su of China and Yu of China (each 2 papers), Bergstrom of Australia, Claxton of Australia, Convey of UK, Degma of Slovakia, Diduszko of Poland, Guil of Spain, Liu of China and Miller of USA (each one paper).

Only a small fraction of the papers (6 of 35) were published by single authors. In other words, most papers (82.9%) were the results of collaboration by two or more authors. Among 29 co-authored papers, over two-thirds (68.2%) were by authors from the same country. In other words, international collaboration accounts for a small proportion of collaborative taxonomic research on Tardigrada.

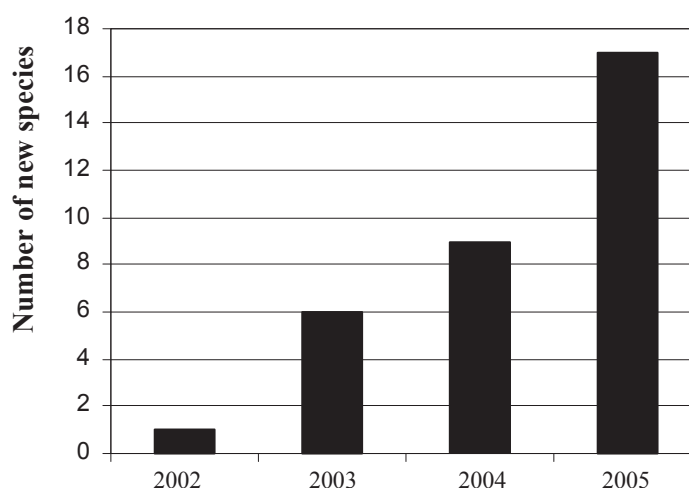
### **Tardigrada nova described in *Zootaxa* 2002–2005**

Since the 1830s, over a thousand species or subspecies of Tardigrada have been described, with over 70% of these described in the last 50 years or some 15 species per year (Fig. 1).



**FIGURE 1.** Number of new species of Tardigrada described every five years (diamond) versus cumulative number of species described at 5-year intervals (summarised from the checklist by Guidetti & Bertolani, 2005).

During 2001–2005, no new genus-group nor family-group taxa of Tardigrada were proposed in *Zootaxa*, but 33 new species were described by 22 authors from nine countries. The number of new tardigrade species in *Zootaxa* increased rapidly from 1 in 2002 to 17 in 2005 (Fig. 2).



**FIGURE 2.** Number of new species of Tardigrada described in *Zootaxa* during 2002–2005.

These 33 species belong to five families: Calohypsibiidae (2 species), Echiniscidae (4 species), Hypsibiidae (11 species), Macrobiotidae (15 species) and Milnesiidae (1 species). They are described from China (5 species), New Zealand (4 species) Australia (3 species), Cyprus, Kirghizia, Mongolia, South Africa and USA (each 2 species), and Cuba, Democratic Republic of Congo, Ecuador, Ireland, Italy, King George Island, Spain and Thailand (each 1 species).

In addition to new species, a new name, *Thulinus* Bertolani, 2003, was proposed to replace *Thulinia* Bertolani, 1981, which is pre-occupied by *Thulinia* Gibson & Bray, 1979.

#### *Catalogue of new species*

Species in this catalogue are listed in alphabetical order and each includes the following information: scientific name, authority, year of publication, page number (country) and family.

<i>Biserovus xiae</i> Li, Su & Yu, 2004: 2 (China)	Macrobiotidae
<i>Bryodelphax brevidentatus</i> Kaczmarek, Michalczyk & Degma, 2005: 34 (China)	Echiniscidae

<i>Diphascon (Diphascon) dolomiticum</i> Pilato & Bertolani, 2005: 2 (Italy)	Hypsibiidae
<i>Diphascon (Diphascon) zaniewi</i> Kaczmarek & Michalczyk, 2004: 2 (South Africa)	Hypsibiidae
<i>Doryphoribius neglectus</i> Pilato & Lisi, 2004: 2 (Australia)	Hypsibiidae
<i>Doryphoribius qinlingense</i> Li, Su & Yu, 2004: 4 (China)	Hypsibiidae
<i>Echiniscus arthuri</i> Pilato, Binda & Lisi, 2005: 28 (New Zealand)	Echiniscidae
<i>Echiniscus barbarae</i> Kaczmarek & Michalczyk, 2002: 2 (Cuba)	Echiniscidae
<i>Echiniscus elaeinae</i> Pilato, Binda & Lisi, 2005: 37 (New Zealand)	Echiniscidae
<i>Haplomacrobotus utahensis</i> Pilato & Beasley, 2005: 2 (USA)	Calohypsibiidae
<i>Hexapodibius christenberryae</i> Pilato & Binda, 2003: 6 (?USA)	Calohypsibiidae
<i>Hypsibius heardensis</i> Miller, McInnes & Bergstrom, 2005: 59 (Australia)	Hypsibiidae
<i>Hypsibius multituberculatus</i> Pilato, Binda & Lisi, 2003: 3 (Democratic Republic of Congo)	Hypsibiidae
<i>Isohypsibius panovi</i> Tumanov, 2004: 1 (Ireland)	Hypsibiidae
<i>Isohypsibius qinlingensis</i> Li, Wang & Yu, 2005: 2 (China)	Hypsibiidae
<i>Isohypsibius taibaiensis</i> Li & Wang 2005: 56 (China)	Hypsibiidae
<i>Minibiotus gumersindoi</i> Guil & Guidetti, 2005: 3 (Spain)	Macrobiotidae
<i>Minibiotus sidereus</i> Pilato, Binda & Lisi, 2003: 2 (Ecuador)	Macrobiotidae
<i>Minibiotus weglarskae</i> Michalczyk, Kaczmarek & Claxton, 2005: 48 (Mongolia)	Macrobiotidae
<i>Macrobiotus alekseevi</i> Tumanov, 2005: 2 (Thailand)	Macrobiotidae
<i>Macrobiotus aradasi</i> Binda, Pilato & Lisi, 2005: 60 (King George Island)	Macrobiotidae
<i>Macrobiotus barabanovi</i> Tumanov, 2005: 34 (Kirghizia)	Macrobiotidae
<i>Macrobiotus dariae</i> Pilato & Bertolani, 2004: 2 (Cyprus)	Macrobiotidae
<i>Macrobiotus divergens</i> Binda, Pilato & Lisi, 2005: 62 (New Zealand)	Macrobiotidae
<i>Macrobiotus garynahi</i> Kaczmarek, Michalczyk & Diduszko, 2005: 37 (Russia)	Macrobiotidae
<i>Macrobiotus kirghizicus</i> Tumanov, 2005: 38 (Kirghizia)	Macrobiotidae
<i>Macrobiotus kovalevi</i> Tumanov, 2004: 2 (New Zealand)	Macrobiotidae

<i>Macrobiotus polonicus</i> Pilato, Kaczmarek, Michalczyk & Lisi, 2003: 2 (Poland)	Macrobiotidae
<i>Macrobiotus reinhardti</i> Michalczyk & Kaczmarek 2003: 3 (Cyprus)	Macrobiotidae
<i>Macrobiotus sicheli</i> Binda, Pilato & Lisi, 2005: 65 (South Africa)	Macrobiotidae
<i>Milnesium katarzynae</i> Kaczmarek, Michalczyk & Beasley, 2004: 2 (China)	Milnesiidae
<i>Parascon nichollsae</i> Pilato & Lisi, 2004: 4 (Australia)	Hypsibiidae
<i>Platicrista horribilis</i> Kaczmarek & Michalczyk, 2003: 2 (Mongolia)	Hypsibiidae

## References

Dates of publication, which are important for nomenclature, are added at the end of each reference (in brackets).

- Bertolani, R. (2003) *Thulinus*, new generic name substituting for *Thulinia* Bertolani, 1981 (Tardigrada, Eutardigrada). *Zootaxa*, 314, 1–4 (1 October).
- Binda, M.G., Pilato, G. & Lisi, O. (2005) Remarks on *Macrobiotus furciger* Murray, 1906 and description of three new species of the *furciger* group (Eutardigrada, Macrobiotidae). *Zootaxa*, 1075, 55–68 (4 November).
- Gibson, D.I. & Bray, R.A. (1979) The Hemiuroidea: terminology, systematics and evolution. *Bulletin of the British Museum (Natural History) (Zoology Series)*, 36, 35–146.
- Guidetti, R. & Bertolani, R. (2005) Tardigrade taxonomy: an updated check list of the taxa and a list of characters for their identification. *Zootaxa*, 845, 1–46 (1 February).
- Guil, N. & Guidetti, R. (2005) A new species of Tardigrada (Eutardigrada: Macrobiotidae) from Iberian Peninsula and Canary Islands (Spain). *Zootaxa*, 889, 1–11 (7 March).
- International Commission on Zoological Nomenclature (1999) *International Code of Zoological Nomenclature. Fourth Edition*. The International Trust for Zoological Nomenclature, London, 306 pp.
- Kaczmarek, Ł. & Michalczyk, Ł. (2002) *Echiniscus barbarae*, a new species of tardigrade from Cuba Island (Tardigrada: Heterotardigrada, Echiniscidae, ‘*arctomys* group’). *Zootaxa*, 53, 1–4 (19 July).
- Kaczmarek, Ł. & Michalczyk, Ł. (2003) *Platicrista horribilis*, a new species of Tardigrada (Eutardigrada: Hypsibiidae) from Mongolia. *Zootaxa*, 132, 1–8 (17 January).
- Kaczmarek, Ł. & Michalczyk, Ł. (2004) Notes on some tardigrades from South Africa, with the description of *Diphascon* (*Diphascon*) *zaniewi* sp. nov. (Eutardigrada: Hypsibiidae). *Zootaxa*, 576, 1–6 (19 July).
- Kaczmarek, Ł. & Michalczyk, Ł. & Beasley, C.W. (2004) *Milnesium katarzynae* sp. nov., a new species of eutardigrade (Milnesiidae) from China. *Zootaxa*, 743, 1–5 (25 November).
- Kaczmarek, Ł. & Michalczyk, Ł. & Degma, P. (2005) A new species of Tardigrada *Bryodelphax brevidentatus* sp. nov. (Heterotardigrada: Echiniscidae) from China (Asia). *Zootaxa*, 1080, 33–38 (15 November).
- Kaczmarek, Ł. & Michalczyk, Ł. & Diduszko, D. (2005) Some tardigrades from Siberia (Russia, Baikal region) with a description of *Macrobiotus garynahi* sp. nov. (Eutardigrada: Macrobi-

- otidae: *richtersi* group). *Zootaxa*, 1053, 35–45 (23 September)
- Li, X.C., Su, L.N. & Yu, D. (2004) *Biserovus xiae* sp. n. and *Doryphoribius qinlingense* sp. n., new species of eutardigrades from China. *Zootaxa*, 660, 1–7 (29 September).
- Li, X. & Wang, L. (2005) *Isohypsibius taibaiensis* sp. nov. (Tardigrada, Hypsibiidae) from China. *Zootaxa*, 1036, 55–60 (15 August).
- Li, X.C., Wang, L.Z., Liu, Y. & Su, L.N. (2005) A new species and five new records of the family Echiniscidae (Tardigrada) from China. *Zootaxa*, 1093, 25–33 (8 December).
- Li, X., Wang, L. & Yu, D. (2005) *Isohypsibius qinlingensis* sp. nov. (Tardigrada, Hypsibiidae) from China. *Zootaxa*, 980, 1–4 (16 May).
- Michalczyk, Ł. & Kaczmarek, Ł. & (2003) A description of the new tardigrade *Macrobiotus reinhardtii* (Eutardigrada: Macrobiotidae, harmsworthi group) with some remarks on the oral cavity armature within the genus *Macrobiotus* Schultze. *Zootaxa*, 331, 1–24 (21 October).
- Michalczyk, Ł., Kaczmarek, Ł. & Claxton, S.K. (2005) *Minibiotus weglarskae*, a new species of Tardigrada (Eutardigrada: Macrobiotidae) from Mongolia. *Zootaxa*, 1008, 47–56 (14 June).
- Miller, W.R., McInnes, S.J. & Bergstrom, D.M. (2005) Tardigrades of the Australian Antarctic: *Hypsibius heardensis* (Eutardigrada: Hypsibiidae: *dujardini* group) a new species from sub-Antarctic Heard Island. *Zootaxa*, 1022, 57–64 (25 July).
- Pilato, G. & Beasley, C. (2005) *Haplomacrobiotus utahensis* new species of Calohypsibiidae (Eutardigrada) from North America. *Zootaxa*, 879, 1–7 (4 March).
- Pilato, G. & Bertolani, R. (2004) *Macrobiotus dariae* sp. n., a new species of eutardigrade (Eutardigrada, Macrobiotidae) from Cyprus. *Zootaxa*, 638, 1–7 (13 September).
- Pilato, G. & Bertolani, R. (2005) *Diphascon* (*Diphascon*) *dolomiticum*, a new species of Hypsibiidae (Eutardigrada) from Italy. *Zootaxa*, 914, 1–5 (24 March).
- Pilato, G. & Binda, M.G. (2003) *Hexapodibius christenberryae*, a new species of tardigrade from North America (Eutardigrada, Calohypsibiidae). *Zootaxa*, 140, 1–6 (31 January).
- Pilato, G., Binda, M.G. & Lisi, O. (2003) Remarks on some species of tardigrades from South America with the description of *Minibiotus sidereus* n. sp. *Zootaxa*, 195, 1–8 (14 May).
- Pilato, G., Binda, M.G. & Lisi, O. (2003) Notes on some tardigrades from Central Africa, with the description of a new species of Hypsibiidae. *Zootaxa*, 241, 1–7 (16 July).
- Pilato, G., Binda, M.G. & Lisi, O. (2005) Remarks on some Echiniscidae (Heterotardigrada) from New Zealand with the description of two new species. *Zootaxa*, 1027, 27–45 (29 July).
- Pilato, G., Kaczmarek, Ł., Michalczyk, Ł. & Lisi, O. (2003) *Macrobiotus polonicus*, a new species of Tardigrada from Poland (Eutardigrada: Macrobiotidae, ‘*hufelandi* group’). *Zootaxa*, 258, 1–8 (4 August).
- Pilato, G. & Lisi, O. (2004) *Doryphoribius neglectus* sp. n. and *Parascon nichollsae* sp. n., new species of eutardigrades from Australia. *Zootaxa*, 545, 1–7 (21 June).
- Tumanov, D.V. (2004) *Macrobiotus kovalevi*, a new species of Tardigrada from New Zealand (Eutardigrada, Macrobiotidae). *Zootaxa*, 406, 1–8 (16 January).
- Tumanov, D.V. (2004) *Isohypsibius panovi*, a new species of Tardigrada from Ireland (Eutardigrada, Hypsibiidae). *Zootaxa*, 812, 1–4 (14 January).
- Tumanov, D.V. (2005) Notes on the Tardigrada of Thailand, with a description of *Macrobiotus alekseevi* sp. nov. (Eutardigrada, Macrobiotidae). *Zootaxa*, 999, 1–16 (27 May).
- Tumanov, D.V. (2005) Two new species of *Macrobiotus* (Eutardigrada, Macrobiotidae) from Tien Shan (Kirghizia), with notes on *Macrobiotus tenuis* group. *Zootaxa*, 1043, 33–46 (30 August).